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September 12, 2003 Mail-Out #MSC-03-08

TO: All Interested Parties

SUBJECT: REQUEST FOR COMMENTS ON PROPOSED AMENDMENTS TO THE DIESEL EMISSION CONTROL STRATEGY VERIFICATION PROCEDURE

Background: In August 1998, the Air Resources Board (ARB or Board) identified particulate matter (PM) from diesel-fueled engines as a toxic air contaminant. Following that determination, the ARB formed a Diesel Advisory Committee with a wide variety of stakeholders to develop the Diesel Risk Reduction Plan (DRRP). A significant component of the DRRP involves reductions of diesel PM emissions from the in-use fleet. To ensure that any retrofit technology used toward that end would achieve real and durable emission reductions, staff developed the Diesel Emission Control Strategy Verification Procedure (the "Procedure"), which was adopted by the Board in May 2002.

Since the adoption of the Procedure, staff has identified several areas that may potentially require amendment, and requests comments. The four primary areas relate to warranty requirements, the proposed verification testing protocol, durability testing requirements, and the nitrogen dioxide (NO_2) emission limit. Specific background information for each area and proposed amendments for the first three are described below. Staff is not proposing amendments to the existing NO_2 emission limit at this time, but is requesting comments and supporting information.

Proposed Amendments to the Procedure: This section describes the amendments to the Procedure currently being considered by staff. Draft regulatory language for the proposed amendments can be found in Attachment 1. The unmodified version of the Procedure adopted by the Board can be found in its entirety on the internet at: http://www.arb.ca.gov/diesel/verifieddevices/reglang051203rev.pdf.

1. Warranty Requirements: Subsequent to the adoption of the Procedure in May 2002, diesel emission control strategy manufacturers began strongly voicing concerns with the warranty requirements, in particular with the extent of liability. Staff commenced working with manufacturers to clarify the requirements within the scope permitted to 15-day changes. Although the manufacturers looked favorably upon the

clarifications staff was able to make, they continued to express dissatisfaction with the requirement that liability include damages to the vehicle or equipment itself, and not simply the engine. Their primary concern is the potential for end-users to make spurious claims with the goal of obtaining new vehicles or equipment. The perceived financial risk has been significant enough to prevent some manufacturers from accepting the required warranty, and thus from attaining verification. Consequently, the range of verified emission control options available to end-users has been reduced.

The manufacturers' concerns have prompted staff to re-evaluate the merit of including vehicle/equipment damage in the warranty. Staff notes that the control strategies thus far encountered appear to have an extremely low probability for causing damage to vehicles and equipment. They tend to be more intimately involved with the engine and its operation than with other vehicle/equipment parts. Therefore, if some potential exists for damage to a significant component, it would most likely be the engine. Even so, the probability of a verified control strategy causing engine damage when used in an appropriate fashion is extremely low. Staff has not yet encountered any such cases.

Because active participation of manufacturers is critical to achieving the goals of the DRRP, and the potential for a verified control strategy to cause non-engine related damage is minimal, staff proposes that the warranty required by ARB not include liability for damage caused to the vehicle or equipment with which a strategy is used. Thus, in the unlikely event such damages occur, the end-user would appeal to existing policies of insurance or other warranties expressed, implied, or statutory in nature.

2. Proposed Verification Testing Protocol: The Procedure currently applies to in-use strategies which are able to control emissions through the use of sound principles of science and engineering (Section 2700). As stated in the Notice of Modified Text (Mail-Out #MSC 03-02), the Procedure is not intended to evaluate emission control strategies that rely on fundamental processes that are not yet based on scientifically thorough knowledge and experience. Such strategies cannot be properly evaluated by staff and must be left to the arena of research.

   In its current form, the Procedure does not include any language describing how staff is to handle products that appear to rely on principles not generally understood or accepted by the scientific world. Staff proposes to clarify that process by adding language to Section 2702(b), which describes the requirements for the Proposed Verification Testing Protocol. In its proposed protocol, the applicant must describe its system's principles of operation. It is the responsibility of the applicant to

demonstrate that its product relies on sound principles of science and engineering to achieve emission reductions. If, after reviewing the proposed protocol, the Executive Officer determines that the applicant has not made a satisfactory demonstration, staff proposes that the applicant be given a second opportunity (60 days) to submit additional material and clarifications that explain the principles of operation. After review of the second submittal, the Executive Officer may determine to either continue the verification process or to suspend the application. If an application has been suspended, it may only be reactivated at the discretion of the Executive Officer. Staff also proposes that if at any point in the verification process the Executive Officer has reason to doubt the scientific or engineering soundness of a product, the Executive Officer can require the applicant to provide further substantiation or risk suspension of the application.

In addition to the above, staff proposes adding another section to the proposed protocol in which the applicant simply states that the applicant agrees to provide a warranty pursuant to the requirements in the Procedure. The purpose of this statement is to ensure that the applicant is aware of the warranty requirements at an early stage in the verification process.

3. Durability Testing Requirements: The Procedure currently requires that emission reduction testing for a diesel emission control strategy be performed before and after the service accumulation period. Although it does not explicitly state that the testing must be performed on the same unit before and after, that is the intention. The verification protocol used to support U.S. EPA's Voluntary Diesel Retrofit Program calls for testing of both a pre-conditioned (or "de-greened") unit and an aged unit at the same point in time, with testing of a single unit at two different times (before and after service accumulation) left as an option. One of the primary advantages of the first option is that it reduces the cost of testing. Laboratory set-up (e.g., setting up an engine in a test cell) and procurement of a test engine or vehicle need only be done once. Also, to the extent that the two units are identical when new, the effects of aging may be more accurately determined since emission results are compared under more nearly identical test conditions (engine emission and test cell variability are minimized).

   Staff proposes that the Procedure be amended to explicitly allow the durability testing requirement to be fulfilled via the testing of two identical units at the same time, one pre-conditioned and one aged, thus further harmonizing with U.S. EPA's program and offering more flexibility to applicants. This testing option should be limited to those control strategies that have no effect on the engine over time. Strategies that include the use of fuel additives, for example, would likely not qualify. Because of the importance of establishing a system's performance when pre-

conditioned, staff will pay close attention to an applicant's request to use the two-unit option. In particular, staff will examine the quality of the evidence the applicant provides to support that the units are identical.

4. Additional Proposed Amendments:

Definitions: Staff added the definitions for the terms "Emergency Use " and "ALSF-1 and ALSF-2" and modified the definitions of the terms "Emergency Standby Engine," "Portable Diesel Engine," and "Stationary Diesel Engine" to make them consistent with the corresponding definitions for those terms in the proposed Airborne Toxic Control Measure to Reduce Diesel Particulate Matter Emissions from Stationary Diesel-Fueled Compression Ignition Engines (stationary ATCM). While the proposed stationary ATCM does not require the use of verified systems, ARB staff anticipates that in some cases owners of stationary diesel engines will use verified technology to comply with the emission limits defined in the proposed ATCM. To avoid potential uncertainty regarding the applicability of the verification emission test results in meeting the proposed stationary ATCM's emission limits, ARB staff believes it is important that the definitions in the Procedure be consistent with the definitions in the proposed ATCM.

Off-road and Stationary Engine Test Requirements: To verify a diesel emission control strategy for use with off-road and stationary engines, applicants must follow the test procedure defined in ARB off-road diesel engine regulations. The original language in subsections 2703(e)(2) and (3) incorrectly implied that applicants could select the most appropriate test cycle included in the off-road regulations. Staff clarified that the regulations require the use of a specific test cycle, but that applicants may nevertheless request the Executive Officer to consider alternatives.

Alternative Test Cycles and Methods: Section 2703(f) lists examples of items that the Executive Officer may consider when evaluating an applicant's request to use an alternative test cycle or method. To that list, staff added test procedures specified in airborne toxic control measures (ATCMs) adopted by the ARB. With that modification, applicants are alerted to the fact that ATCMs may specify test procedures that differ from those in the Procedure, but that those test procedures may be used towards verification with approval from the Executive Officer.

NO_2 Emission Limit: In addition to the proposed amendments described above, staff also requests comments on the existing NO_2 emission limit in the Procedure. The NO_2 emission limit most directly affects diesel emission control strategies that oxidize nitric oxide in the exhaust to NO_2 to assist with the oxidation of PM. Such strategies have

been shown to emit oxides of nitrogen (NOx) that have a significantly higher fraction of NO_2 than was originally present in the engine's exhaust. To investigate the effects of large-scale implementation of high-NO_2 strategies, ARB conducted atmospheric modeling for various NO_2 fractions. After reviewing the results of the modeling, staff determined that an NO_2 emission limit of 20 percent of the total baseline NOx emissions (by mass) would both minimize potential negative side effects (such as increases in ozone exposure) and potentially leave the door open for effective strategies that rely on the NO_2 oxidation mechanism. To give manufacturers time to redesign their control strategies to meet the limit, the Board approved an effective date of January 1, 2004.

Subsequent to the adoption of the Procedure, staff received comments from manufacturers which, for the most part, did not support the NO_2 limit. One such comment indicated that the variability of engine-out NO_2 will reduce the ability of verifications to cover a range of engine families, thus dramatically increasing the cost of verification. Another stated that there are engines in California with engine-out NO_2 levels in excess of 20 percent. Following the letter of the Procedure would prohibit retrofit of those engines unless a control strategy actually reduced the engine-out NO_2 fraction. There was also a comment that the effective date will not provide adequate time for development of compliant products, and another that flatly stated it is impossible for catalyzed filter systems to comply with the NO_2 limit.

The lack of an adequate characterization of diesel engine NO_2 emissions makes resolving the issues raised in such comments difficult. Historically, NO_2 has never been measured during diesel engine emissions testing. ARB's atmospheric modeling assumed an average engine-out NO_2 fraction of 10 percent, which is the conventional fraction used when modeling NOx emissions from combustion sources. The accuracy of that assumption for diesel engines specifically is not well established, nor how the NO_2 fraction may vary from one engine to another. The manufacturers' claim that there are engines with engine-out NO_2 fractions in excess of 20 percent is supported by data, although extremely limited data. Beyond the issue of engine-to-engine variability, there are also questions surrounding how engine-out NO_2 emissions may vary over different test cycles. The same questions apply to how control strategies alter NO_2 emissions. Heavily-catalyzed diesel particulate filters, for instance, have been shown to both meet and greatly exceed the NO_2 limit depending on the choice of test engine and test cycle.

At this time, staff requests comments with supporting information regarding the need to delay the effective date of the NO_2 limit to allow more time for additional data gathering and product development. In addition to comments that either support or oppose a delay, staff requests that manufacturers report on the status of their efforts to meet the

NO_2 limit. The Board will find information such as test results for modified systems, plans to investigate various design modifications, and product development timeframes very useful in arriving at a decision on the need for a delay.

Written Comments: Staff encourages written comments on the proposed amendments to the Procedure. To ensure that any confidential information be handled properly, commenters should identify confidential information as such when submitted. The guidelines for how ARB handles information designated as confidential can be found on ARB's website (http://www.arb.ca.gov/regact/confid.htm). Comments will be most helpful if they are submitted as soon as possible, and prior to **October 1, 2003**.

Should you have any questions or comments regarding the proposed amendments to the Procedure and the NO_2 emission limit, please contact Mr. Paul Henderick by e-mail at phenderi@arb.ca.gov or by phone at (626) 350-6440, or contact Mr. Scott Rowland, Manager, Retrofit Assessment Section, by e-mail at srowland@arb.ca.gov or by phone at (626) 575-6972.

Special Note Regarding the Distribution of Mail-Outs: Interested parties can sign up on the ARB website to receive e-mail notifications with links to new mail-outs from the Mobile Source Control Division. E-mail notification was developed to minimize the number of hardcopies issued for future mailings, and to enable the interested public to receive mailings more expeditiously. If you or your company has access to the internet and you are interested in receiving mailings this way, please follow the instructions found here: http://www.arb.ca.gov/listserv/ms-mailings/ms-mailings.htm. After you have signed up, please contact Ms. Neidy Pinuelas at (626) 350-6454 so that she can remove your address from the hardcopy list.

Sincerely,

/s/

Robert H. Cross, Chief
Mobile Source Control Division

Attachments